NOTES ON THE GENUS *TEUCRIDIUM (VERBENACEAE)*

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Even though it is now impractical to try to prepare the thorough and detailed monograph of this genus as originally planned and announced, it may be worthwhile to place on record the bibliographic and herbarium notes on the genus assembled by my wife, Alma L. Moldenke, and myself over the past 52 years. The herbarium acronyms herein employed are the same as have been used by me in the long series of papers in this journal (and some other journals) on the previous 69 genera so treated and are most recently fully explained in Phytologia Memoirs 2: 463--469 (1980).

TEUCRIDIUM Hook. f., Fl. N. Zeal. 1: 203, pl. 49. 1853.

Bibliography: Hook. f., Fl. N. Zeal. 1: 203, pl. 49. 1853; C. Müll. in Walp., Ann. Bot. Syst. 5: 704--705. 1860; Bocq., Adansonia, ser. 1, 3: 86, 107, 119, 128, 149, 183, & 205--206. 1862; Hook. f., Handb. N. Zeal. Fl. 224, 739, & 795. 1864; F. Muell., Fragm. 6: 153. 1868; Benth., Fl. Austral. 5: 56. 1870; Pfeiffer, Nom. Bot. 2 (2): 1381. 1874; Benth. in Benth. & Hook. f., Gen. Pl. 2 (2): 1136 & 1157. 1876; Baill., Hist. Pl. 11: 87 & 114 (1891) and 11: 493. 1892; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 142, 173, 176, & 177, fig. 66 B--D. 1895; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 1055. 1895; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 383. 1897; Dalla Torre & Harms, Gen. Siphonog., imp. 1, 433. 1904; Post & Kuntze, Lexicon 555 & 688. 1904; Cheeseman, Man. N. Zeal. Fl., ed. 1, 566. 1906; Laing & Blackwell, Pl. N. Zeal., ed. 1, 350--351 & 455. 1906; Cheeseman, Man. N. Zeal. Fl., ed. 2, 764 & 1159. 1925; Laing & Blackwell, Pl. N. Zeal., ed. 2, 354, 356, & 467. 1927; Stapf, Ind. Lond. 6: 277. 1931; Fedde & Schust., Justs Bot. Jahresber. 53 (1): 1076. 1932; Junell, Symb. Bot. Upsal. 1 (4): 128--130 & 204, fig. 206 & 207. 1934; Laing & Blackwell, Pl. N. Zeal., ed. 4, 371, 373, & 498. 1940; Cranwell, Rec. Auckl. Inst. Mus. 2: 298. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 70 & 100. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 1055. 1946; Mols., Alph. List Inv. Names Suppl. 1: 21. 1947; H. N. & A. L. Mold., Pl. Life 2: 24 & 34. 1948; A. R. Cooper, Rec. Auckl. Inst. Mus. 3: 401. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 155 & 197. 1949; Erdtman, Pollen Morph. Pl. Tax., ed. 1, 449. 1952; Angely, Cat. Estat. Gen. Bot. Fan. 17: 6. 1956; Mold., Résumé 211, 354, 413, & 470. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew.. imp. 3, 2: 1055. 1960; Allan, Fl. N. Zeal. 1: 960. 1961; Hartl, Beitr. Biol. Pfl. 37: 293. 1962; Beuzenberg & Hair, N. Zeal. Journ. Bot. 1: 57 & 63, fig. 25. 1963; Dalla Torre & Harms, Gen. Siphonog., imp. 2, 433. 1963; Cave, Ind. Pl. Chromos. 2: 330. 1964; Laing & Blackwell, Pl. N. Zeal., ed. 7, 371, 373, & 498. 1964; F. A. Barkley, List Ord. Fam. Anthoph. 76 & 215. 1965; Dalla Torre & Harms, Gen. Siphonog., imp. 2, 433. 1965; Airy Shaw

in J. C. Willis, Dict. Flow. Pl., ed. 7, 1113. 1966; Erdtman, Pollen Morph. Pl. Tax., ed. 2, 449. 1966; Stafleu, Tax. Lit. 208. 1967; Bolkh., Grif, Matvej., & Zakhar., Chromos. Numb. Flow. Pl., imp. 1, 716. 1969; Rouleau, Guide Ind. Kew. 186 & 353. 1970; Balgooy, Blumea Suppl. 6: [Pl. Geogr. Pacif.] 200. 1971; Erdtman, Pollen Morph. Pl. Tax., ed. 3, 449. 1971; Mold., Fifth Summ. 1: 350 (1971) and 2: 641, 763, & 911. 1971; Mukhopadhyay, Pollen Morph. Verb. [thesis]. 1971; Went, Taxon 20: 199. 1971; Mold., Phytologia 23: 511. 1972; Mukherjee, Sci. Cult. 38: 143--144. 1972; Mukherjee, Pollen Morph. Aff. Teuc. [1]--3. 1972; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 1143. 1973; Thanikaimoni, Trav. Inst. Franç. Pond. Sec. Scient. Tech. 12 (2): 123 & 149. 1973; Anon., Biol. Abstr. 58 (10): B.A.S.I.C. E.299. 1974; Gibbs, Flow. Pl. 3: 1752--1754. 1974; Bolkh., Grif, Matvej., & Zakhar., Chromos. Numb. Flow. Pl., imp. 2, 716. 1974; Kooiman, Act. Bot. Neerl. 24: 462. 1975; Munir, Journ. Adelaide Bot. Gard. 1: 16 & 25. 1976; Thanikaimoni, Trav. Inst. Franç. Pond. Sect. Scient. Tech. 13: 233 & 328. 1976; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 44 & 47. 1978; Mold., Phytologia 46: 191 & 511. 1980; Mold., Phytol. Mem. 2: 340, 361, 445, & 578. 1980.

Tall herbs or much-branched, softly wooded and virgate subglabrous shrubs; branches slender, tetragonal, divaricate; branchlets sometimes in superposed pairs in the leaf-axils, tetragonal; leaves small, simple, decussate-opposite, petiolate, exstipulate, deciduous; leaf-blades spatulate or ovate-rounded, marginally entire or irregularly lobed; flowers small, axillary, solitary or in few-flowered cymes, short-pedicellate; two bracteoles borne beneath each flower, linear-setaceous; calyx gamosepalous, broadly campanulate, inferior, 5-veined, 5-lobed to about the middle, the lobes subequal, subulate, apically acute; corolla gamopetalous, zygomorphic, campanulate, the tube short, apically broadly ampliate, pilose, equaling the calyx, the limb conspicuously oblique, spreading, bilabiate, unequally 5-parted, the lobes oblong, apically obtuse, the posterior ones shorter and exterior, the anterior (lower) one longest; stamens 4, didynamous, attached at or somewhat above the base of the corolla-tube, long-exserted between the posterior corolla-lobes, incurved, fertile; anthers peltate, the 2 thecae confluent, 1-celled, finally outwardly extended, laterally dehiscent, dorsifixed at the middle; pistil single, compound; style basally sunken between the ovary-lobes, exserted, arcuate, apically bifid, the branches subulate and apically short-stigmatiferous; ovary compound, superiot, bicarpellary, ahortly 4-lobed apically and there densely pilose or villous, 2- or imperfectly 4-celled, the cells each 1-ovulate; ovules attached laterally at the middle, pendulous; fruit small, drupaceous, sunken in the persistent fruiting-calyx, 4-lobed almost to the middle, virtually dry, the exocarp only thinly fleshy, hispid, the endocarp heavy, ultimately splitting into 4 pyrenes or nutlets; seeds attached laterally, one in each pyrene, exalbuminous, the testa thin; cotyledons large, ovate, radicle inferior, short.

Type species: *Teucridium parvifolium* Hook. f.

As far as is known now, this is a monotypic rather variable genus endemic to New Zealand, named in allusion to its resemblance to the lamiaceous genus *Teucrium*, the wood-sages or germanders. It is peculiar because of its obvious lamiaceous gynoecium with a sunken style-base. Cheeseman (1925) avers that, in spite of this character, it is allied to *Vitex* Tourn. Bentham (1876) says of it: "Genus inter *Viticeas* inflorescentia et habitu anomalum et tribum arcte cum *Ajugoideis Labiatarum* connectit, sed ovarium et fructus potius priorum."

Hooker (1864) says that it is "A genus of two species, one found in subtropical Australia (*T. sphaerocarpum*, Muell.), the other the following [*T. parvifolium*]. The lobed ovary is anomalous in the Order [*Verbenaceae*], and shows a tendency towards *Labiatae*, but the reversed position of the flower at once distinguishes this."

Angely (1956) also asserts that the genus contains two species, but, as now interpreted, it contains only a single species and a rather questionable subspecific form. The "second" species mentioned by Hooker (above) apparently is a mis-identification of an Australian species of *Spartothamnella* Briq.

It is worth noting here that Hooker's original description of *Teucridium* is often cited as having been published in "1854" -- as, for instance, by Pfeiffer (1874), Post & Kuntze (1904), Jackson (1895), Dalla Torre & Harms (1906), and Angely (1956) -- but the actual date of publication of pages 1--160 of volume 1 was 1852 and of pages 161--312 was 1853, as pointed out by Stafleu (1967). Stapf (1931) uses the correct date.

Junell (1934) gives a lengthy and important account of the gynoecium morphology and relationships of the genus: "Die mittleren Partien der Fruchtblätter besitzen an der Innenseite ziemlich kräftiger Anschwellungen und verwachsen sowohl oberhalb dieses Niveaus als auch unten im Fruchtknoten mit den Plazenten. Letztere verwachsen erst verhältnismässig tief unten im Fruchtknoten iteinander. Die Stellung der Samenanlagen im Verhältnis zur Plazenta ergibt sich aus Fig. 206. Die Wandung der Höhle zwischen den Plazenten ist reichlich mit Drüsenhaaren besetzt.

"In Engler & Prantl....wird angegeben, dass die Frucht ein mehr oder weniger fleischiges Exokarp besitzt. Hooker....macht bei Beschreibung der Pflanze folgende Angaben: 'Fruit a small fourlobed hispid nut, sunk in the bottom of the withered persistent calyx, of four achenia, each hard, one-celled, with one pendulous exalbuminous seed.' Ich hatte Gelegenheit, einige wenige Früchte zu studieren. Die Wandung der Teilfrucht ist hart und kann sicher nur ganz wenig fleischig gewesen sein.

"In Engler & Prantl wird, wie erwähnt, diese Gattung in *Clerodendreae* untergebracht. Hooker....bezeichnet die Pflanze als 'a very curious plant, resembling a *Teucrium;* but truly Verbenaceous, and though so different in habit, allied to *Vitex*.' Bentham..... ist der Ansicht, dass die vierteilige Fruchtknoten und die Frucht für eine Verwandschaft sprechen mit '*Oxera* and a few other genera, which connect *Verbenaceae* with the tribe *Ajugoideae* of *Labiatae*.'

Auch Cheeseman.....verweist auf die Verwandschaft mit *Vitex*: 'Although allied to *Vitex*, it has the anomalous character of a 4-lobed ovary, thus showing an approach to the *Labiatae*.' Die Gattung kann meines Erachtens gut in *Ajugeae* eingereiht oder wenigstens als Übergangstypus zu dieser Subtribus betrachtet werden. Als solcher Übergangstypus wäre die Gattung vielleicht am ehesten an der Spitze dieser Gruppe einzureihen. Dass *Teucridium* mit *Vitex* oder *Viticeae* nahe verwandt sein soll, scheint mir wenig glaubhaft. Demgegenüber liegen zahlteiche Gründe für eine Anknüpfung der Gattung an *Clerodendreae* vor. Aus der Stellung der Samenanlagen ergibt sich jedoch, dass diese Anknüpfung nicht bei *Oxera* oder ihr benachbarten Gattungen zu erfolgen hat.....Die Subtribus [*Ajugeae*] weicht dadurch von den übrigen in *Viticoideae* ab, dass die Frucht zerfällt und trocken ist. Bei *Teucridium* und *Spartothamnus* scheint jedoch die Frucht etwas saftig zu sein. Die Entwicklung zur trockenen Frucht wurde in diesem Falle nicht von einer Reduktion der Samenanzahl begleitet wie bei *Petraeovitex* und *Teijsmanniodendreae*.

"*Ajugeae* ist meines Erachtens als eine direkte Fortsetzung der Gruppe von Gattungen in *Clerodendreae* zu betrachten, bei denen die Samenanlagen nicht ungewöhnlich hoch inseriert sind. Die auscheinend ursprünglichsten Gattungen in *Ajugeae* stimmen mit *Clerodendreae* darin überein, dass die Sträucher sind. Die Mehrzahl der Gattungen sind jedoch Kräuter oder Halbsträucher."

Excluded species: *Teucridium sphaerocarpum* Muell. ex Hook. f., Handb., N. Zeal. Fl. 224 & 739. 1864 = *Spartothamnella* sp., *Chloanthaceae*.

TEUCRIDIUM PARVIFOLIUM Hook. f., Fl. N. Zeal. 1: 208, pl. 49. 1853.

Synonymy: *Spartothamnus hookeri* F. Muell., Fragm. 6: 153. 1868. *Teucridium parviflorum* Hook. f. ex Mold., Alph. List Inv. Names Suppl. 1: 21, in syn. 1947; Erdtman, Pollen Morph. Pl. Tax., ed. 1, 449. 1952. *Teucridium paucifolium* A. Cunn. ex Mold., Phytol. Mem. 2: 445, in syn. 1980.

Bibliography: see bibliography of the genus as a whole (above).

Illustrations: Hook. f., Fl. N. Zeal. 1: pl. 49. 1853; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 176, fig. 66 B--D. 1895; Junell, Symb. Bot. Upsal. 1 (4): 128, fig. 206 & 207. 1934; Beuzenberg & Hair, N. Zeal. Journ. Bot. 1: 63, fig. 25. 1963; Mukherjee, Sci. Cult. 38: 144, fig. 1. 1972; Mukherjee, Pollen Morph Aff. Teuc. 2. 1972.

An erect, much- and closely-branched, slender, twiggy, soft-wooded shrub, 0.7--1.8 m. tall, forming close thickets, dichotomously branched, the branches and leaves more or less pubescent; branches slender, twiggy; branchlets tetragonal, pubescent when young; leaves rather distant; petioles 4--12.5 mm. long, equaling the leaf-blade; leaf-blades membranous, orbicular or orbicular-ovate to ovate-spatulate or spatulate. or even broadly ovate or elliptic, 4--15 mm. long, apically obtuse, sometimes irregularly lobed; flowers axillary, solitary or in very small few-flowered cymes; peduncles short, 2-bracteolate; flowers about 8 mm. long;

calyx campanulate, persistent, the 5 teeth subulate, apically sharply acute; corolla campanulate, white or sometimes flushed with pale-blue or blue, hairy, 8--12.5 mm. long; fruiting-calyx 4 mm. in diameter; nutlets (cocci) hispid; chromosome number: 2n = 64.

This, the type species of the genus, is based on an unnumbered Colenso collection from the Wairarapa Valley, on North Island, New Zealand, deposited in the Kew herbarium. The species is endemic to New Zealand, especially the marginal areas of both islands from 35° to 46°30' lat., nut is local in distribution and not common anywhere. It flowers from October to January and fruits from December to March.

Beuzenberg & Hair (1963), Cave (1964), and Bolkhovskikh & al. (1969) all report the haploid chromosome number as 32.

The only common or vernacular name reported for the plant is "small-leaved teucridium".

Junell (1934) has described the gynoecium morphology (see above) and Erdtman (1952) the pollen -- both on the basis of *Du Rietz & DuRietz 1166-1* in the Stockholm herbarium. Erdtman's description of the pollen is: "3-colpate (operculicolpate), prolate (48 x 34 mu). Sexine thicker than nexine, particularly at the poles. LO (probably S-pattern). Grains of almost exactly the same type as those of *Teucrium*." Mukherjee (1972) has amplified this description as follows: "pollen grains 3-colpate, colpa provided with operculum, about 35.5 mu x 6.0 mu. Mean intercolpial distance ± 19.5 mu. Amb convex. Mean apocolpium diameter about 8.0 mu. Prolate, P/E about 42.0 mu x 36.0 mu. Exine about 4.0 mu and about 2.0 mu thick at poles and at equator respectively. Sexine about 3.5 mu and about 1.5 mu at the said regions respectively. Pertectate. tectum thick and solid, beset with excrescences. Nexine 0.5 mu thick." He comments that the "Pollen morphology of the two genera, *Teucridium* (*Verbenaceae*) and *Teucrium* (*Labiatae*), display almost every possible similar characters [sic]. The pollen grains of both the genera are 3-colpate with operculum in colpa, pertectate sexine with excrescences on tectum, thicker polar exine, similarity in shape, etc. Only minor differences are there. It may be mentioned that such pollen characters are absent in other members of the said families.

"Gross morphologically the close affinity of the two families which were put forward by various authors has also been supplemented by palynology. Both *Teucridium* and *Teucrium,* although belong[ing] to two different families, display almost the same morphological characters" and since "Similarity of structure.... [is] taken as a sure indication of genetic relationship"..... such relationship "is reflected in both gross morphology as well as.....palynology" and the "close affinity of *Verbenaceae* and *Labiatae*" is further suggested by the pollen morphology of these two genera.

Gibbs (1974) reports saponins "probably present" and tannins "probably absent" in *T. parvifolium;* cyanogenesis and leucoanthocyanin and syringin are absent; the Juglon test proved negative (bark) and the HCl/methanone test also gave negative results, but the Ehrlich test (leaves) gave positive (pale-green) results.

Recent collectors describe the plant as a shrub, 2--3 feet tall, and have found it growing among rocks on exposed hillsides and in lowland mixed rainforests, flowering in December and fruiting in March.

It should be pointed out here again that the original publication of this species is mis-dated "1854" -- it was actually published in 1853. Hooker (1864) cites unnumbered collections of Colenso from North Island and of Bidwill, Raoul, and Traverse from "Middle Island", the last-mentioned collected at Nelson and at Canterbury Plains. Cheeseman (1925) cites unnumbered collections of Adams, Armstrong, Aston, Bidwill, Buchanan, Cockayne, Colenso, Kirk, Petrie, Raoul, Traverse, "and others" from both North and South Islands.

Citations: NEW ZEALAND: North: *DuRietz & DuRietz 1166.1* (S), *3341* (S); *Poole 56562* (Er, Z). South: *A. W. Anderson 89* (Ca--586686, N, W--1675961); *Berggren s.n.* [Jan. 1874] (S); *Cheeseman s.n.* [Foxhill, Nelson] (Bi), *s.n.* [Jan. 1882] (W--206576), *s.n.* [1882] (Pa); *Cranwell s.n.* [Kitchener Park, June 1932] (Ca--517845, Ca--517846), *s.n.* [Kitchener Park, 26/6/32] (Gg--204314); *Haast s.n.* [Canterbury, 1866] (Br, Br); *Neal 452* (Bi). Island undetermined: *Allen s.n.* [4/1/33] (Go, N--photo, Z--photo); *Meebold 4378* (Ba, Mu, Z). CULTIVATED: New Zealand: *E. H. Walker 4755* (W--1994076).

TEUCRIDIUM PARVIFOLIUM f. *LUXURIANS* (Cheeseman) Mold., stat. nov.

Synonymy: *Teucridium parvifolium* var. *luxurians* Cheeseman, Man. N. Zeal. Fl., ed. 2, 764. 1925.

Bibliography: Cheeseman, Man. N. Zeal. Fl., ed. 2, 764. 1925; Fedde & Schust, Justs Bot. Jahresber. 53 (1): 1076. 1932; R. Cooper, Rec. Auckl. Inst. Mus. 3: 401. 1949; Mold., Résumé 211 & 470. 1959; Allan, Fl. N. Zeal. 1: 960. 1961; Mold., Fifth Summ. 1: 350 (1971) and 2: 911. 1971; Mold., Phytol. Mem. 2: 340 & 578. 1980.

This form differs from the typical form of the species only in having generally larger leaves, the blades up to 20 mm. long and often lobed and the flowers usually (but not invariably) in 2- or 3-flowered cymes.

The form is based on an unnumbered H. H. Allan collection from river-flats by the Mangles River (a tributary of the Buller River), in the Buller Valley, South Island, New Zealand, deposited in the Auckland Museum herbarium.

Allen (1961) avers that "Similar forms occur elsewhere within the range of the species. It is probable that the differences are due to different habitat conditions", making it only an edaphic form. As yet I have seen no authentic material of it.